

MONTHLY NOTICES

OF THE

ROYAL ASTRONOMICAL SOCIETY.

VOL. XLVII.

JANUARY 14, 1887.

No. 3

J. W. L. GLAISHER, M.A., F.R.S., President, in the Chair.

Rev. W. Birks, Wanstead Villa, Villiers Road, Southsea;
 Captain Thomas Exham, Officers' Club, Canute Road,
 Southampton;

Shelley Fisher, The Priory, Larkhall Rise, S.W.;

Cuthbert Hutchinson, Rock Lodge, Roker, Sunderland;

William Edward Jackson, Constantinople;

Captain Thomas Mackenzie, Royal Mail s.s. "Moselle,"
 Southampton;

Horace Pearce, F.G.S., F.L.S., The Limes, Stourbridge; and

James Cruikshank Roger, The Grange, Walthamstow, Essex;

were balloted for and duly elected Fellows of the Society.

Observations of the Moon made at the Radcliffe Observatory, Oxford, during the year 1886, and a Comparison of the Results with the Tabular Places from Hansen's Lunar Tables. By E. J. Stone, M.A., F.R.S.

The present Paper contains the Right Ascensions and North Polar Distances of the Moon as deduced from the observations made at the Radcliffe Observatory during the year 1886. These results are here compared with those deduced from Hansen's Lunar Tables on two suppositions:—

- (1) That the mean times, found in the usual way from the sidereal times at mean noon given in the *Nautical Almanac*, were *not* changed in 1864.
- (2) That the mean times *were* changed in 1864, in accordance with the views which I have explained in Papers already communicated to the Society.

For facilities for an accurate comparison between Hansen's Lunar Tables and Observations we are again indebted to the places published in the *Connaissance des Temps*.

G

TABLE I.
Radcliffe Observations of the Moon, 1886.

Day, 1886.	Observer.	Observed R.A.			Observed N.P.D.			Seconds of Hansen's R.A.	Hansen <i>minus</i> Observed. Uncorrected for Error in Time.	Correction due to Error in Time.	Hansen <i>minus</i> Observed. Uncorrected for Error in Time.	Correction due to Error in Time.	Seconds of Hansen's N.P.D.	Hansen <i>minus</i> Observed. Uncorrected for Error in Time.	Correction due to Error in Time.	Hansen <i>minus</i> Observed. Corrected for Error in Time.
		h	m	s	°	'	"	s	s	s	"	"	"	"	"	"
Jan. 13	R.	1	42	43.61	44	22		44.22	+0.61	-1.13	-0.52	82	47	36.54	32.87	+1.47
14	W.	2	35	15.17	15	81		15.81	+0.64	-1.19	-0.55	79	3	23.17	19.32	+0.83
15	R.	3	31	3.83	4	33		4.33	+0.50	-1.26	-0.76	75	47	4.11	1.00	+0.77
18	R.	6	39	11.33	12	04		12.04	+0.71	-1.45	-0.74	71	37	18.45	16.69	-2.48
19	R.	7	45	39.16	40	07		40.07	+0.91	-1.45	-0.54	72	52	52.47	54.03	-1.02
Feb. 11	W.	3	9	2.33	3	00		3.00	+0.67	-1.20	-0.53	77	9	16.05	13.89	+1.97
23	F.B.	15	6	15.95	17	27		17.27	+1.32	-1.19	+0.13	102	39	10.57	14.24	-0.49
25	R.	16	53	13.22	14	48		14.48	+1.26	-1.17	+0.09	107	14	32.31	35.33	+1.14
Mar. 15	R.	7	46	9.80	10	38		10.38	+0.58	-1.38	-0.80	72	57	59.61	60.41	-1.60
16	W.	8	48	35.22	36	12		36.12	+0.90	-1.37	-0.47	75	22	44.65	48.38	-0.21
17	F.B.	9	50	14.33	15	17		15.17	+0.84	-1.35	-0.51	78	51	16.77	20.33	-1.63
19	R.	11	49	33.45	34	28		34.28	+0.83	-1.29	-0.46	87	49	5.18	10.27	-1.27
23	F.B.	15	35	35.70	37	02		37.02	+1.32	-1.22	+0.10	104	15	27.99	31.44	-0.25
April 15	W.	11	22	57.39	58	28		58.28	+0.89	-1.27	-0.38	85	36	32.83	36.33	-2.66
May 14	R.	12	54	6.09	6	87		6.87	+0.78	-1.22	-0.44	93	3	34.16	38.72	-1.53
15	F.B.	13	48	56.08	57	18		57.18	+1.10	-1.22	-0.12	97	27	30.09	34.93	-0.79

Day, 1886.	Observer.	Observed R.A.			Seconds of Hansen's R.A.	Hansen <i>minus</i> Observed. Uncorrected for Error in Time.	Correction due to Error in Time.	Hansen <i>minus</i> Observed. Corrected for Error in Time.	Seconds of Hansen's N.P.D.	Observed N.P.D.	Hansen <i>minus</i> Observed. Uncorrected for Error in Time.	Correction due to Error in Time.	Hansen <i>minus</i> Observed. Corrected for Error in Time.
		h	m	s									
33:27	May 18	W.	16	35 18.29	19.69	+1.40	-1.24	+0.16	22.57	106 57 21.00	+1.57	-2.50	-0.93
33:38	June 15	W.	17	9 4.71	5.92	+1.21	-1.23	-0.02	15.38	107 56 14.29	+1.09	-1.76	-0.67
33:49	July 12	R.	16	50 56.44	57.47	+1.03	-1.22	-0.19	32.87	107 21 30.94	+1.93	-2.23	-0.30
33:49	14	F.B.	18	39 6.98	8.08	+1.10	-1.21	-0.11	24.34	108 44 24.93	-0.59	+0.37	-0.22
33:50	15	F.B.	19	32 7.40	8.67	+1.27	-1.18	+0.09	25.90	108 0 28.00	-2.10	+1.59	-0.51
33:51	17	F.B.	21	13 58.17	59.61	+1.44	-1.12	+0.32	44.41	104 4 48.16	-3.75	+3.59	-0.16
33:52	20	R.	23	36 50.09	51.18	+1.09	-1.05	+0.04	30.72	94 0 33.29	-2.57	+5.22	+2.65
33:61	Aug. 11	W.	19	15 5.48	6.67	+1.19	-1.18	+0.01	33.65	108 17 33.79	-0.14	+1.17	+1.03
33:61	13	W.	20	57 25.08	26.20	+1.12	-1.13	-0.01	5.53	104 56 8.29	-2.76	+3.28	+0.52
33:64	20	F.B.	2	31 43.95	44.95	+1.00	-1.14	-0.14	32.29	79 58 35.59	-3.30	+4.77	+1.47
33:71	Sept. 7	R.	18	58 9.93	10.94	+1.01	-1.20	-0.19	51.73	108 29 50.55	+1.18	+0.78	+1.96
33:73	10	W.	21	30 32.34	33.45	+1.11	-1.11	0.00	22.32	103 9 24.48	-2.16	+3.85	+1.69
33:73	11	R.	22	18 45.79	46.63	+0.84	-1.08	-0.24	10.81	100 4 15.68	-4.87	+4.54	-0.33
33:74	13	W.	23	52 55.22	56.56	+1.34	-1.06	+0.28	23.58	92 44 27.02	-3.44	+5.33	+1.89
33:75	15	W.	1	27 17.77	18.92	+1.15	-1.09	+0.06	42.60	84 50 46.47	-3.87	+5.30	+1.43
33:75	16	R.	2	15 59.36	60.41	+1.05	-1.12	-0.07	41.81	81 4 44.89	-3.08	+4.94	+1.86
33:75	17	W.	3	6 27.27	28.49	+1.22	-1.17	+0.05	43.98	77 39 46.36	-2.38	+4.33	+1.95
33:82	Oct. 4	R.	18	38 41.48	42.59	+1.11	-1.23	-0.12	14.35	108 44 13.39	+0.96	+0.33	+1.29
33:84	8	R.	22	2 9.21	10.29	+1.08	-1.09	-0.01	20.40	101 15 23.86	-3.46	+4.35	+0.89

Q 2

Day, 1886.	Observer.	Observed R.A.			Observed N.P.D.			Hansen <i>minus</i> Observed. Corrected for Error in Time.	Correction due to Error in Time.	Hansen <i>minus</i> Observed. Uncorrected for Error in Time.	Seconds of Hansen's N.P.D.
		h	m	s	°	'	"	"	"	"	"
Oct. 11	R.	0	23	41.56	90	8	28.22	-0.21	-1.08	-4.54	23.68
13	F.B.	1	59	56.03	82	12	44.46	+0.14	-1.13	-3.92	40.54
Nov. 1	R.	19	10	4.62	108	38	45.57	+0.02	-1.24	-0.72	44.85
2	W.	20	3	20.88	107	24	16.13	-0.10	-1.19	-4.78	11.35
5	R.	22	31	49.12	99	22	22.56	-0.03	-1.09	-4.02	18.54
8	R.	0	52	52.63	87	44	23.14	-0.15	-1.09	-4.50	18.64
9	W.	1	41	13.85	83	42	20.76	-0.02	-1.12	-2.70	18.06
Dec. 1	F.B.	21	23	49.37	104	5	47.60	+0.14	-1.14	-2.23	45.37
2	R.	22	12	36.64	101	1	34.56	-0.02	-1.10	-4.14	30.42
3	W.	22	59	57.40	97	30	33.12	+0.02	-1.07	-2.87	30.25
4	F.B.	23	46	32.35	93	40	47.51	-0.05	-1.07	-3.24	44.27
7	W.	2	9	26.08	81	38	4.42	-0.21	-1.15	-3.75	0.67
9	W.	3	54	44.79	74	48	9.89	-0.36	-1.27	-3.83	6.06
10	R.	4	51	47.64	72	24	47.87	-0.30	-1.33	-2.26	45.61
Mean of Errors without regard to sign ...											
Mean Errors for Year ...											

TABLE II.

Radcliffe Observations of the Moon, 1886.

*Errors of the Moon's Tabular Place in Longitude and Ecliptic Polar Distance,
"Uncorrected" and "Corrected" for the change in Mean Time introduced
in 1864.*

Day.		Errors of Longitude (Hansen minus Observed.)		Errors of E.N.P.D. (Hansen minus Observed.)	
		Uncorrected.	Corrected.	Uncorrected.	Corrected.
1886.					
Jan.	13	+ 9 ^h 80	− 7 ^h 76	− 0 ^h 16	− 1 ^h 41
	14	+ 10 ^h 18	− 7 ^h 97	− 0 ^h 73	− 1 ^h 73
	15	+ 7 ^h 83	− 10 ^h 95	− 1 ^h 28	− 1 ^h 90
	18	+ 9 ^h 99	− 10 ^h 71	− 2 ^h 46	− 1 ^h 74
	19	+ 13 ^h 16	− 7 ^h 82	− 0 ^h 79	+ 0 ^h 37
Feb.	11	+ 10 ^h 05	− 8 ^h 02	+ 0 ^h 57	− 0 ^h 20
	23	+ 19 ^h 66	+ 1 ^h 70	− 1 ^h 79	− 0 ^h 99
	25	+ 18 ^h 32	+ 1 ^h 41	+ 0 ^h 96	+ 0 ^h 99
March	15	+ 8 ^h 35	− 11 ^h 61	− 0 ^h 69	+ 0 ^h 47
	16	+ 13 ^h 62	− 6 ^h 65	+ 0 ^h 10	+ 1 ^h 62
	17	+ 12 ^h 86	− 7 ^h 63	− 0 ^h 80	+ 0 ^h 99
	19	+ 13 ^h 44	− 6 ^h 83	− 0 ^h 29	+ 1 ^h 58
	23	+ 19 ^h 53	+ 1 ^h 36	− 1 ^h 15	− 0 ^h 58
April	15	+ 13 ^h 61	− 6 ^h 27	− 2 ^h 00	− 0 ^h 21
May	14	+ 12 ^h 56	− 6 ^h 68	− 0 ^h 32	+ 1 ^h 14
	15	+ 17 ^h 05	− 1 ^h 95	− 1 ^h 30	− 0 ^h 10
	18	+ 20 ^h 18	+ 2 ^h 15	− 1 ^h 33	− 1 ^h 25
June	15	+ 17 ^h 36	− 0 ^h 34	− 0 ^h 41	− 0 ^h 64
July	12	+ 14 ^h 92	− 2 ^h 75	+ 0 ^h 16	+ 0 ^h 03
	14	+ 15 ^h 67	− 1 ^h 55	+ 0 ^h 49	− 0 ^h 33
	15	+ 18 ^h 26	+ 1 ^h 35	+ 0 ^h 74	− 0 ^h 30
	17	+ 21 ^h 14	+ 4 ^h 50	+ 2 ^h 68	+ 1 ^h 24
	20	+ 16 ^h 00	− 0 ^h 50	+ 4 ^h 11	+ 2 ^h 67
Aug.	11	+ 16 ^h 87	+ 0 ^h 01	+ 2 ^h 07	+ 1 ^h 04
	13	+ 16 ^h 36	− 0 ^h 28	+ 1 ^h 89	+ 0 ^h 46
	20	+ 15 ^h 12	− 2 ^h 44	+ 1 ^h 52	+ 0 ^h 74
Sept.		+ 14 ^h 22	− 2 ^h 89	+ 2 ^h 62	+ 1 ^h 68
	10	+ 16 ^h 08	− 0 ^h 53	+ 3 ^h 08	+ 1 ^h 60
	11	+ 13 ^h 34	− 3 ^h 19	− 0 ^h 09	− 1 ^h 58

Day.		Errors of Longitude (Hansen minus Observed.)		Errors of E.N.P.D. (Hansen minus Observed)	
		Uncorrected.	Corrected.	Uncorrected	Corrected.
1886.		"	"	"	"
Sept.	13	+ 19'80	+ 3'10	+ 4'85	+ 3'40
	15	+ 17'44	+ 0'30	+ 2'77	+ 1'66
	16	+ 15'75	− 1'60	+ 2'24	+ 1'41
	17	+ 17'90	+ 0'17	+ 2'63	+ 2'08
Oct.	4	+ 15'73	− 1'79	+ 2'00	+ 1'17
	8	+ 16'09	− 0'45	+ 2'25	+ 0'78
	11	+ 13'82	− 3'28	+ 0'99	− 0'36
	13	+ 19'12	+ 1'51	+ 2'84	+ 1'91
Nov.	1	+ 17'93	+ 0'24	+ 1'43	+ 0'39
	2	+ 16'27	− 0'89	− 1'48	− 2'73
	5	+ 16'06	− 0'69	+ 2'06	+ 0'53
	8	+ 14'77	− 2'50	+ 1'32	+ 0'13
	9	+ 16'31	− 1'27	+ 3'38	+ 2'45
Dec.	1	+ 18'40	+ 1'44	+ 3'64	+ 2'17
	2	+ 16'34	− 0'43	+ 1'78	+ 0'30
	3	+ 16'08	− 0'58	+ 3'60	+ 2'16
	4	+ 15'31	− 1'56	+ 3'10	+ 1'72
	7	+ 14'44	− 3'47	+ 1'17	+ 0'42
	9	+ 13'71	− 5'11	− 1'01	− 1'05
	10	+ 14'96	− 4'32	− 0'53	− 0'12
Mean of Errors, without regard to sign		... 15''·342	3''·316	1''·666	1''·153
Mean Errors for Year		+ 15''·342	− 2''·531	...	...

TABLE III.

Mean Excess over Observation of the “Moon’s Tabular Place in Longitude,” for the Years 1847 to 1886, as computed from Hansen’s Tables.

“Uncorrected” and “Corrected” on and after 1864 for the change in Mean Tabular Time introduced in the year 1884.

Year.		Errors of Longitude (Hansen minus Observed.)		Year.		Errors of Longitude. (Hansen minus Observed.)	
		Uncorrected.	Corrected.			Uncorrected.	Corrected.
1847	+ 1'07	+ 1'07		1852	− 0'92	− 0'92	
1848	+ 0'20	+ 0'20		1853	− 1'63	− 1'63	
1849	− 0'47	− 0'47		1854	− 1'68	− 1'68	
1850	− 0'28	− 0'28		1855	− 0'87	− 0'87	
1851	− 1'29	− 1'29		1856	− 0'96	− 0'96	

Year.	Errors of Longitude (Hansen minus Observed.)		Year.	Errors of Longitude (Hansen minus Observed.)	
	Uncorrected.	Corrected.		Uncorrected.	Corrected.
1857	−1"86	−1"86	1872	+ 7"31	+ 0"10
1858	−1"98	−1"98	1873	+ 8"24	+ 0"20
1859	−1"80	−1"80	1874	+ 9"29	+ 0"56
1860	−2"90	−2"90	1875	+ 9"87	+ 0"36
1861	−2"19	−2"19	1876	+ 9"80	−0"51
1862	−2"83	−2"83	1877	+ 9"23	−1"90
1863	−1"61	−1"61	1878	+ 8"22	−3"60
1864	+ 0"12	−0"81	1879*	+ 9"63	−3"12
1865	+ 1"27	−0"22	1880	+ 10"89	−2"77
1866	+ 2"14	−0"22	1881	+ 10"51	−4"06
1867	+ 3"48	+ 0"36	1882†	+ 12"68	−2"51
1868	+ 4"12	+ 0"28	1883	+ 14"71	−1"50
1869	+ 4"28	−0"35	1884	+ 14"65	−1"91
1870	+ 4"83	−0"66	1885	+ 15"14	−1"87
1871	+ 6"96	+ 0"44	1886‡	+ 15"34	−2"53

Radcliffe Observatory, Oxford:
1887, January 4.

Mean Right Ascensions of *Polaris*, *Cephei* 51 (*Hev.*), δ *Ursæ Minoris*, and λ *Ursæ Minoris* for the year 1887, from the Radcliffe Observations of the years 1880 to 1886. By E. J. Stone, M.A., F.R.S.

From the year 1880 to the year 1886 the azimuth errors of the Transit Circle at the Radcliffe Observatory have been based on the *Nautical Almanac* places of the stars *Polaris*, *Cephei* 51 (*Hev.*), δ *Ursæ Minoris*, λ *Ursæ Minoris*, after the application of corrections kindly furnished by the Astronomer Royal from year to year. The azimuth errors thus found agree well *inter se*, except those found from *Polaris* and *Polaris* S. P., which differ more than is desirable from each other and from the results found from observations of the other three stars. It has, therefore, been thought necessary to collect the results. It will be seen that the Right Ascensions of the Radcliffe Observations agree remarkably closely with the corrected *Nautical Almanac* places given by the Astronomer Royal for the three stars, *Cephei* 51, δ *Ursæ Min.*, and λ *Ursæ Min.*, but that the resulting Right Ascensions of *Polaris* agree much more closely with the tabular Right Ascensions of the *Berliner Jahrbuch*.

* All to 1879, Greenwich Observations.
† 1880 to 1882, Mean of Greenwich and Radcliffe.
‡ 1883 and since, Radcliffe only.